INSTALLATION INSTRUCTION

CONTENTS

CAUTION: READ ALL SAFETY GUIDES BEFORE YOU BEGIN TO INSTALL YOUR UNIT.

SAVE THIS MANUAL

STEALTH

16 SEER 2 TO 5 TON

AIR CONDITIONING UNIT

SPLIT-SYSTEM COOLING

MODELS: H4TS024
H4TS030
H4TS036
H4TS048
H4TS060

GENERAL

This instruction covers the installation of the following Stealth air conditioning units.

NOMENCLATURE

H 4 TS 030 S 06

Product Category

H = Condensing Unit

Product Generation

4 = Design Level

Product Identifier

TS = 16.00 SEER Condensing Unit

Nominal Cooling Capacity

024 = 24,000 BTUH
030 = 30,000 BTUH
036 = 36,000 BTUH
048 = 48,000 BTUH
060 = 60,000 BTUH

Refrigerant Line Connections

S = Sweat-Connect

Voltage Code

06 = 208/230-1-60

The outdoor condensing units are designed to be installed with corresponding variable speed air handlers or furnacs, two stage furnaces and single speed air handlers or furnaces and a corresponding coil with sweat connect lines. Each unit is factory charged with refrigerant sufficient for the smallest indoor evaporator coil plus 15 feet of field supplied vapor and liquid lines. A balanced port hard shut-off TXV kit must be used for optimum system performance.

SAFETY

Use this instruction in conjunction with the instruction for the appropriate indoor evaporator coil, variable speed air handler or furnace and other accessories. Read all instructions before installing the unit.

Installer should pay particular attention to the words: NOTE, CAUTION and WARNING.

NOTES are intended to clarify or make the installation easier.

CAUTIONS are given to prevent equipment damage.

WARNINGS are given to alert the installer that personal injury and/or equipment damage may result if installation procedures are not handled properly.

CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

WARNING

Incorrect installation may create a condition where the operation of the product could cause personal injury or property damage.

INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing. See Form 50.15-NM for more information.

LIMITATIONS

The unit should be installed in accordance with all national and local safety codes and the limitations listed below:

1. Limitations for the indoor unit, coil and appropriate accessories must also be observed.
2. Optimal performance is gained by using a variable speed air handler or furnace. Special care must be given when matched with a single speed blower (furnace or air handler) and a relay kit to maintain the proper dehumidification. See section on dehumidification for details.
3. The outdoor unit must not be installed with any duct work in the air stream. The outdoor fan is the propeller type and is not designed to operate against any additional external static pressure.
4. The unit should not be operated at outdoor temperatures below 60 °F. ***The unit is not designed to operate with a low ambient kit.*** Do not modify the control system to operate with any type of low ambient kit.
5. Indoor evaporator coil orifice ***must be removed prior to*** the installation of a factory supplied balanced port TXV kit.

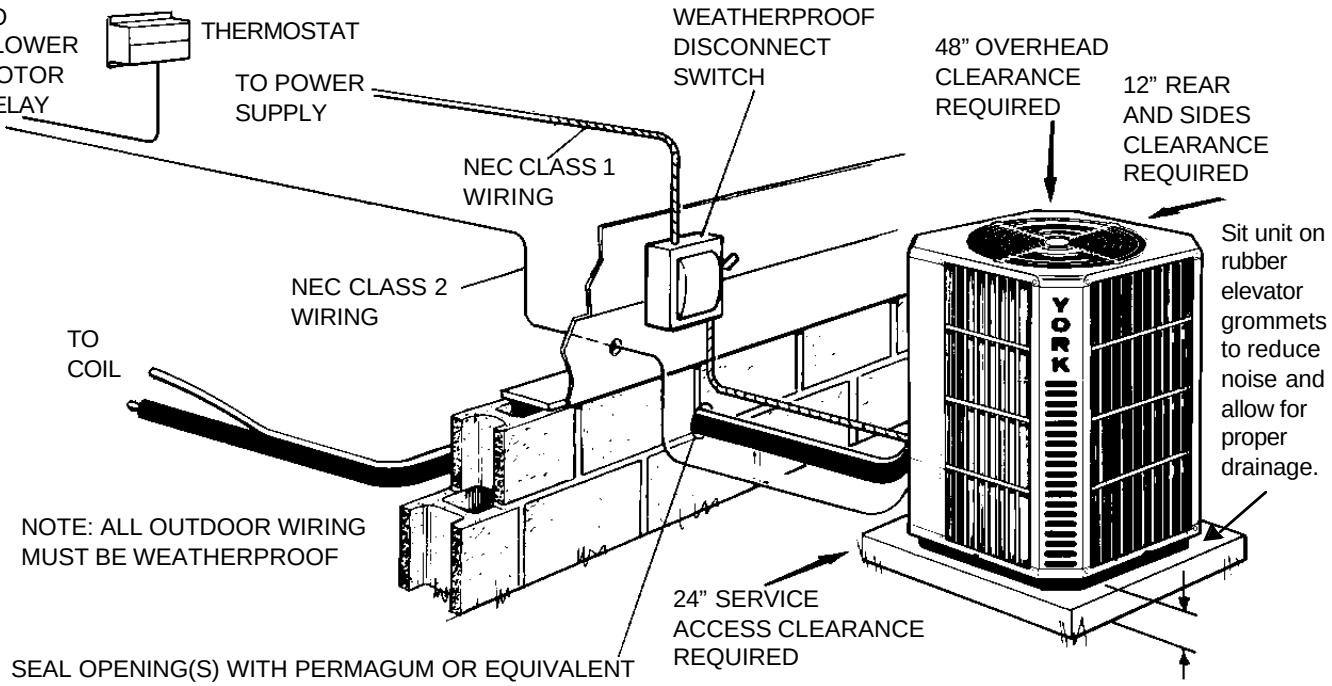

FIGURE 1: TYPICAL INSTALLATION

LOCATION

Before starting the installation, select and check the suitability of the location for both the indoor and outdoor unit. Observe all limitations and clearance requirements.

The outdoor unit must have sufficient clearance for air entrance to the condenser coil, for air discharge and for service access. See Figure 1.

If the unit is to be installed on a hot sun exposed roof or a black-topped ground area, the unit should be raised sufficiently above the roof or ground to avoid taking the accumulated layer of hot air into the outdoor unit.

Provide an adequate structural support.

GROUND INSTALLATION

The unit may be installed at ground level on a solid base that will not shift or settle, causing strain on the refrigerant lines and possible leaks. Maintain the clearances shown in Figure 1 and install the unit in a level position. Isolate the base from the structure to avoid noise or vibration transmission.

Isolate the unit from rain gutters to avoid any possible wash out of the foundation.

Normal operating sound levels may be objectionable if the unit is placed directly under windows of certain rooms (bedrooms, study, etc.).

ROOF INSTALLATION

When installing units on a roof, the structure must be capable of supporting the total weight of the unit, including a pad, lintels, rails, etc., which should be used to minimize the transmission of sound or vibration into the conditioned space.

UNIT PLACEMENT

1. Provide a base in the pre-determined location.
2. Remove the shipping carton and inspect for possible damage.
3. Compressor tie-down bolts should remain tightened.
4. Position the unit on the base provided.
5. Sit unit on the (4) rubber elevating grommets provided with the unit. These should be positioned as shown in Figure 2 to reduce noise and allow for proper drainage.
6. Make a hole(s) in the structure wall large enough to accommodate the insulated vapor line, the liquid line and the wiring.

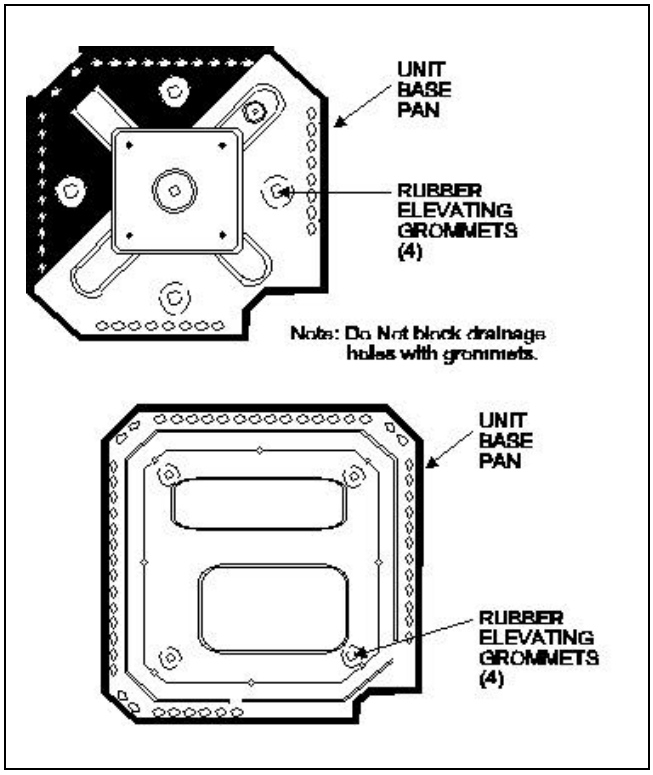

FIGURE 2 : POSITIONING GROMMETS

TXV INSTALLATION

This condensing unit requires the installation of a thermal expansion valve. The TXV controls the superheat of the refrigerant at the outlet of the evaporator coil, ensuring the proper refrigerant temperature at the suction of compressor. Following are the basic steps for installing the TXV. For detail instructions, refer to the Installation Instructions accompanying the TXV kit.

Install TXV kit as follows:

1. First, relieve the holding charge by depressing the Schrader valve located in the end of the liquid line.

⚠ WARNING

The evaporator coil is under 30 psig pressure.

2. After holding charge is completely discharged, loosen and remove the liquid line fitting from the orifice distributor assembly. Note that the fitting has **right hand threads**.
3. Remove the orifice from the distributor body using a small diameter wire or paper clip. Orifice is not used when the TXV assembly is installed.
4. After orifice is removed, install the thermal expansion valve to the orifice distributor assembly with supplied fittings. Hand tighten and turn an additional 1/8 turn to seal. Do not overtighten fittings.
5. Reinstall the liquid line to the top of the thermal expansion valve. Hand modify the liquid line to align with casing opening.
6. Install the TXV equalizer line into the vapor line as follows:
   a. Select a location on the vapor line for insertion of the equalizer line which will not interfere with TXV bulb placement.
   b. Use an awl to punch through the suction tube and insert the awl to a depth to achieve a 1/8 inch diameter hole.
7. Install TXV equalizer line in 1/8 hole previously made in vapor line. Equalizer line can be bottomed out in vapor line as end of equalizer line is cut on 45 degrees angle to prevent blockage. Braze equalizer line making sure that tube opening is not brazed closed.

⚠ CAUTION

Dry nitrogen should always be supplied through the tubing while it is being brazed, because the temperature required is high enough to cause oxidation of the copper unless an inert atmosphere is provided. The flow of dry nitrogen should continue until the joint has cooled. Always use a pressure regulator and safety valve to insure that only low pressure dry nitrogen is introduced into the tubing. Only a small flow is necessary to displace air and prevent oxidation.

All connections to be brazed are copper-to-copper and should be brazed with a phosphorous-copper alloy material such as Silfos-5 or equivalent. DO NOT use soft solder.

Install the TXV bulb to the vapor line near the equalizer line, using the two bulb clamps furnished with the TXV assembly. Ensure the bulb is making maximum contact. Refer to TXV installation instruction for view of bulb location.

⚠ CAUTION

In all cases, mount the TXV bulb after vapor line is brazed and has had sufficient time to cool.

   a. Bulb should be installed on a horizontal run of the vapor line if possible. On lines under 7/8" OD the bulb may be installed on top of the line. With 7/8" OD and over, the bulb should be installed at the position of about 4 or 8 o'clock.
   b. If bulb installation is made on a vertical run, the bulb should be located at least 16 inches from any bend,

and on the tubing sides opposite the plane of the bend. On vertical bulb installations, the bulb should be positioned with the bulb tail at the top, so that the bulb acts as a reservoir.

c. Bulb should be insulated using thermal insulation provided to protect it from the effect of the surrounding ambient temperature.

PIPING CONNECTIONS

The outdoor condensing unit may be connected to the indoor evaporator coil using field supplied refrigerant grade copper tubing that is internally clean and dry. Units should be installed only with the tubing sizes for approved system combinations as specified in Tabular Data Sheet. The charge given is applicable for total tubing lengths up to 15 feet. See Application Data Form 690.01-AD1V for installing tubing of longer lengths and elevation differences.

NOTE: *Using a larger than specified line size could result in oil return problems. Using too small a line will result in loss of capacity and other problems caused by insufficient refrigerant flow. Slope horizontal vapor lines at least 1" every 20 feet toward the outdoor unit to facilitate proper oil return.*

PRECAUTIONS DURING LINE INSTALLATION

1. Install the lines with as few bends as possible. Care must be taken not to damage the couplings or kink the tubing. Use clean hard drawn copper tubing where no appreciable amount of bending around obstruction is necessary. If soft copper must be used, care must be taken to avoid sharp bends which may cause a restriction.
2. The lines should be installed so that they will not obstruct service access to the coil, air handling system or filter.
3. Care must also be taken to isolate the refrigerant lines to minimize noise transmission from the equipment to the structure.
4. The vapor line must be insulated with a minimum of 1/2" foam rubber insulation (Arm-A-Flex or equivalent). Liquid lines that will be exposed to direct sunlight and/or high temperatures must also be insulated.

Tape and suspend the refrigerant lines as shown. DO NOT allow metal-to metal contact. See Figure 3.

5. Use PVC piping as a conduit for all underground installations as shown in Figure 4. Buried lines should be kept as short as possible to minimize the build up of liquid refrigerant in the vapor line during long periods of shutdown.
6. Pack fiber glass insulation and a sealing material such as permagum around refrigerant lines where they penetrate a wall to reduce vibration and to retain some flexibility.

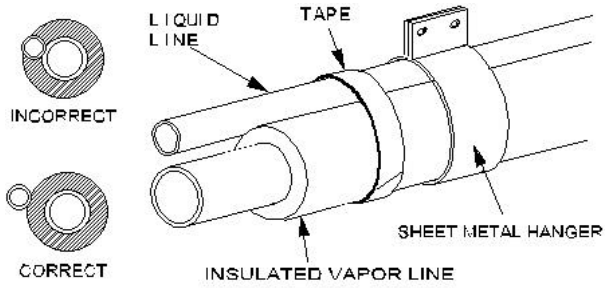

FIGURE 3 : TUBING HANGER

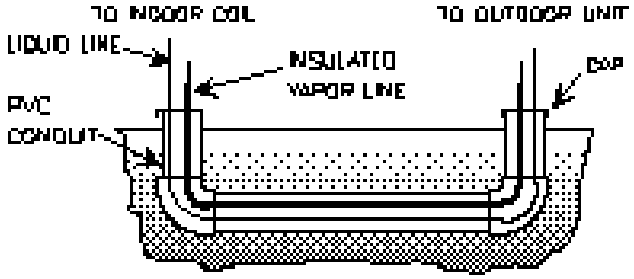

FIGURE 4 : UNDERGROUND INSTALLATION

7. See Form 690.01-AD1V for additional piping information.

PRECAUTIONS DURING BRAZING OF LINES

All outdoor unit and evaporator coil connections are copper-to-copper and should be brazed with a phosphorous-copper alloy material such as Silfos-5 or equivalent. DO NOT use soft solder.

⚠ CAUTION

Dry nitrogen should always be supplied through the tubing while it is being brazed, because the temperature required is high enough to cause oxidation of the copper unless an inert atmosphere is provided. The flow of dry nitrogen should continue until the joint has cooled. Always use a pressure regulator and safety valve to insure that only low pressure dry nitrogen is introduced into the tubing. Only a small flow is necessary to displace air and prevent oxidation.

The outdoor units have re-usable service valves on both the liquid and vapor connections. The total system refrigerant charge is retained within the outdoor unit during shipping and installation. The re-usable service valves are provided to evacuate and charge per this instruction.

Serious service problems can be avoided by taking adequate precautions to assure an internally clean and dry system.

PRECAUTIONS DURING BRAZING ANGLE VALVE

Precautions should be taken to prevent heat damage to angle valve by wrapping a wet rag around it as shown in Figure 5. Also, protect all painted surfaces and insulation during brazing. After brazing - cool joint with wet rag.

⚠ WARNING

This is not a backseating valve. The service access port has a valve core. Opening or closing valve does not close service access port.

If the valve stem is backed out past the retaining ring, the O-ring can be damaged causing leakage or system pressure could force the valve stem out of the valve body possibly causing personal injury. In the event the retaining ring is missing, do not attempt to open the valve.

Valve can be opened by removing the plunger cap and fully inserting a hex wrench into the stem and backing out counterclockwise until valve stem just touches retaining ring.

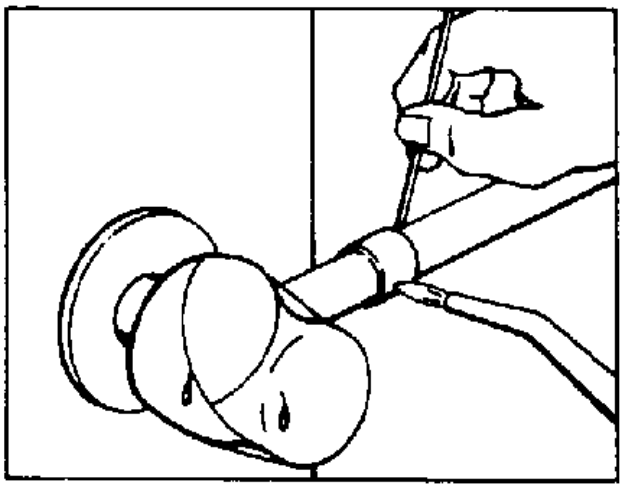

FIGURE 5 : HEAT PROTECTION

⚠ CAUTION

If visual verification of the valve stem reaching the retaining ring is impossible, stop backing out the.valve stem when the slightest increase in resistance is felt. Because of the small size and therefore the reduced resistance, back out the liquid valve 5 turns maximum *to prevent going past the retaining ring.*

Replace plunger cap finger tight, then tighten an additional 1/12 turn (1/2 hex flat). Cap must be replaced to prevent leaks.

Connect the refrigerant lines using the following procedure:

1. Remove the cap and Schrader core from both the liquid and vapor angle valve service ports at the outdoor unit. Connect low pressure nitrogen to the liquid line service port.
2. Braze the liquid line to the liquid valve at the outdoor unit. Be sure to wrap the valve body with a wet rag. Allow the nitrogen to continue flowing.
3. Carefully remove the rubber plugs from the evaporator liquid and vapor connections.

⚠ CAUTION

The evaporator is pressurized.

4. Braze the liquid line to the evaporator liquid connection. The nitrogen should now be flowing through the evaporator coil.
5. Slide the grommet away from the vapor connection at the coil. Braze the vapor line to the evaporator vapor connection. After the connection has cooled, slide the grommet back into original position.
6. Protect the vapor valve with a wet rag and braze the vapor line connection. The nitrogen flow should be exiting the system from the vapor service port connection. After this connection has cooled, remove the nitrogen source from the liquid fitting service port.
7. Evacuate the vapor line, evaporator and the liquid line, to 500 microns or less.
8. Leak test all refrigerant piping connections including the service port flare caps to be sure they are leak tight. DO NOT OVERTIGHTEN (between 40 and 60 inch - lbs. maximum).

NOTE: Do not use the system refrigerant in the outdoor unit to purge or leak test.

9. Do not remove the flare caps from the service ports except when necessary for servicing the system.

> **⚠ CAUTION**
>
> *Do not connect manifold gauges unless trouble is suspected. Approximately 3/4 ounce of refrigerant will be lost each time a standard manifold gauge is connected.*

10. Release the refrigerant charge into the system. Open both the liquid and vapor valves by removing the plunger cap and with an allen wrench back out counter-clockwise until valve stem just touches retaining ring. Release the refrigerant charge into the system. See "Precautions During Brazing Angle Valves" on page 6.

11. If the refrigerant tubing, indoor evaporator coil or outdoor condensing unit has developed a leak during shipment, or was, for any other reason, opened to the atmosphere for more than four (4) minutes, it is necessary to evacuate the system down to at least 500 microns to eliminate contamination and moisture in the system.

If a leak is suspected, leak test to locate the leak. To verify the leak, close the valve to the vacuum pump suction to isolate the pump and hold the system under vacuum. If the micron gauge indicates a steady and continuous rise after a few minutes, it's an indication of a leak. If the gauge shows a rise, then levels off after a few minutes and remains fairly constant, its an indication that the system is leak free, but still contains moisture and may require further evacuation if the reading is above 1000 microns.

> **⚠ WARNING**
>
> *Never attempt to repair any brazed connections while the system is under pressure. Personal injury could result.*

See "System Start Up" section for checking and recording system charge.

ELECTRICAL CONNECTIONS

GENERAL INFORMATION & GROUNDING

Check the electrical supply to be sure that it meets the values specified on the unit nameplate and wiring label.

Power wiring, control (low voltage) wiring, disconnect switches and over current protection to be supplied by the installer. Wire size should be sized per NEC requirements.

> **⚠ CAUTION**
>
> *All field wiring must USE COPPER CONDUCTORS ONLY and be in accordance with Local, National Fire, Safety & Electrical Codes. This unit must be grounded with a separate ground wire in accordance with the above codes.*

The complete connection diagram and schematic wiring label is located on the inside surface of the unit electrical box cover and this instruction.

POWER WIRING

1. Install the proper size weatherproof disconnect switch outdoors and within sight of the unit.

2. Run power wiring from the disconnect switch to the unit.

3. Remove the control box cover to gain access to the unit wiring. Route wires from disconnect through power wiring opening provided and into the unit control box as shown in Figure 6.

4. Install the proper size time-delay fuses or circuit breaker, and make the power supply connections.

5. Energize the crankcase heater to save time by preheating the compressor oil while the remaining installation is completed.

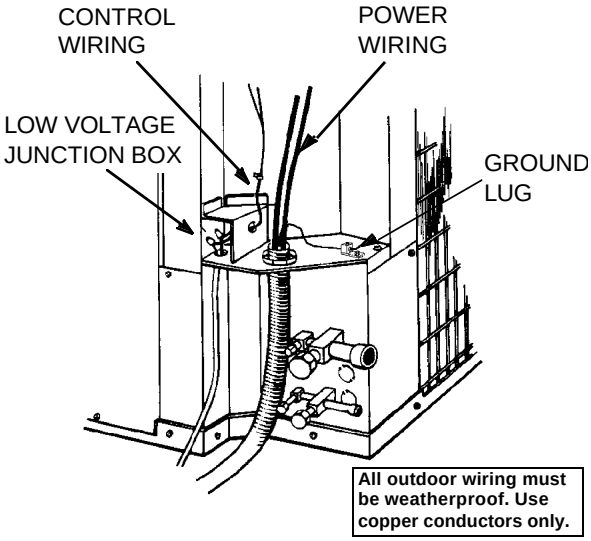

FIGURE 6 : TYPICAL FIELD WIRING

ACCESSORY WIRING

The electrical accessories available for this unit are a two stage cooling thermostat and an optional De-humidification Control. Refer to the individual instructions packaged with the accessories for installation.

THERMOSTAT MOUNTING / WIRING

This condensing unit must be installed with the factory recommended thermostat, 2ET04700224 or any conventional two-stage cooling thermostat. The difference between the two stages of a typical two-stage thermostat is 2 - 2.5 °F.

The thermostat should be located about 5 ft. above the floor, where it will be exposed to normal room air circulation. Do not place it on an outside wall or where it is exposed to the radiant effect from exposed glass or appliances, drafts from outside doors or supply air grilles.

After the thermostat is mounted, route the 24-volt control wiring (NEC Class 2) from the thermostat to the indoor variable speed air handler and outdoor unit. Route the control wiring into the grommeted hole in the bottom of control box of the outdoor unit. Using wire nuts connect to leads inside the low voltage junction shown in Figure 6 and wiring diagrams shown in Figures 7 -10.

Interconnecting control wiring must be a minimum of No. 18 AWG color coded insulated wires. If wire lengths increase more than 90 feet, use No. 16 AWG wires, to prevent excessive voltage drop.

NOTE: *To eliminate erratic operation, seal the hole in the wall at the thermostat with permagum or equivalent to prevent air drafts affecting the anticipators in the thermostat.*

DE-HUMIDIFICATION CONTROL

A de-humidification control accessory 2HU06700124 may be required in high humidity areas. This control provides cooling at a reduced air flow, lowering evaporator temperature and increasing latent capacity. To install, refer to instructions packaged with the accessory and per Figure 7. Prior to the installation of the de-humidistat control, the jumper across the de-humidistat control terminals on the indoor variable speed air handler/furnace terminal board must be removed.

During first or second stage cooling, if the relative humidity in the space is higher than the desired set point of the de-humidistat control, the variable speed blower motor will operate at a lower speed until the de-humidification control is satisfied. A 40 - 60% relative humidity level is recommended to achieve optimum comfort.

NOTE: *If a de-humidification control is installed, it is recommended that a minimum air flow of 325 cfm/ton be supplied at all times.*

FIELD CONNECTIONS - CONTROL WIRING

The recommended field connections for specific indoor air handlers and furnaces are shown in Figures 7 through 10. All connects to the outdoor unit are made in the low voltage junction box in the bottom left corner of the control box. Feed all control wiring through the grommet in the bottom of the box. Care should be taken so that all wire nut connections are firm with no exposed wires that could short within the box. If the fault line (X/L) is not connected to the thermostat, it should be capped securely inside the box.

Variable Speed Air Handlers and Furnaces - connections shown in Figure 7. The first stage thermostat signal is connected to Y1 at the air handler/furnace control. It is critical the Y2 OUT signal is connected to Y at the air handler/furnace control to properly control the blower speed.

Single Speed Air Handlers and Furnaces - connections shown in Figures 8 and 9. It is mandatory to connect the appropriate blower relay to operate the low speeds. The first stage thermostat signal is connected directly to Y1 on the outdoor unit. Do not connect to Y at the indoor control. The first stage blower operation is controlled by the G signal. It is critical the Y2 OUT signal is connected to Y at the air handler/furnace control to properly control the blower speed by switching the relay to the high speed tap.

Two Stage Furnaces - connection shown in Figure 10. The first stage thermostat signal is connected directly to Y1 on the outdoor unit. Do not connect to Y at the indoor control. The first stage blower operation is controlled by the G signal. It is critical the Y2 OUT signal is connected to Y at the furnace control to properly control the blower speed.

INDOOR BLOWER SPEED SETTINGS

Refer to the Tabular Data Sheet for the recommended air flow settings for each size condensing unit.

Variable Speed Air Handlers and Furnaces - Set the high speed cooling speed per the instructions for the air handler or furnace by selecting the correct “cool” and “ADJ” taps. The low speed setting will automatically be programmed for the correct airflow. Verify the airflow by LED display on the speed selection board.

Single Speed Air Handlers and Furnaces - It is mandatory a fan relay kit be applied to the furnace or air handler. The air handlers are designed to use the 2SF06700124 fan relay and the furnaces should use a SPDT 24VAC Coil (15 AMP rating @ 115V). See figures 8 and 9 for wiring connections. The ideal fan setting is to set the high speed (second stage) air flow at the fan motor high speed and the low speed (first-stage) airflow at the fan low speed. If the low speed air flow is too high, unsatifactory dehumidifaction may occur on first stage operation. To correct for unsatisfactory dehumidification, either add a dehumidistat per figures 8 and 9 or change the blower motor for better air flow performance.

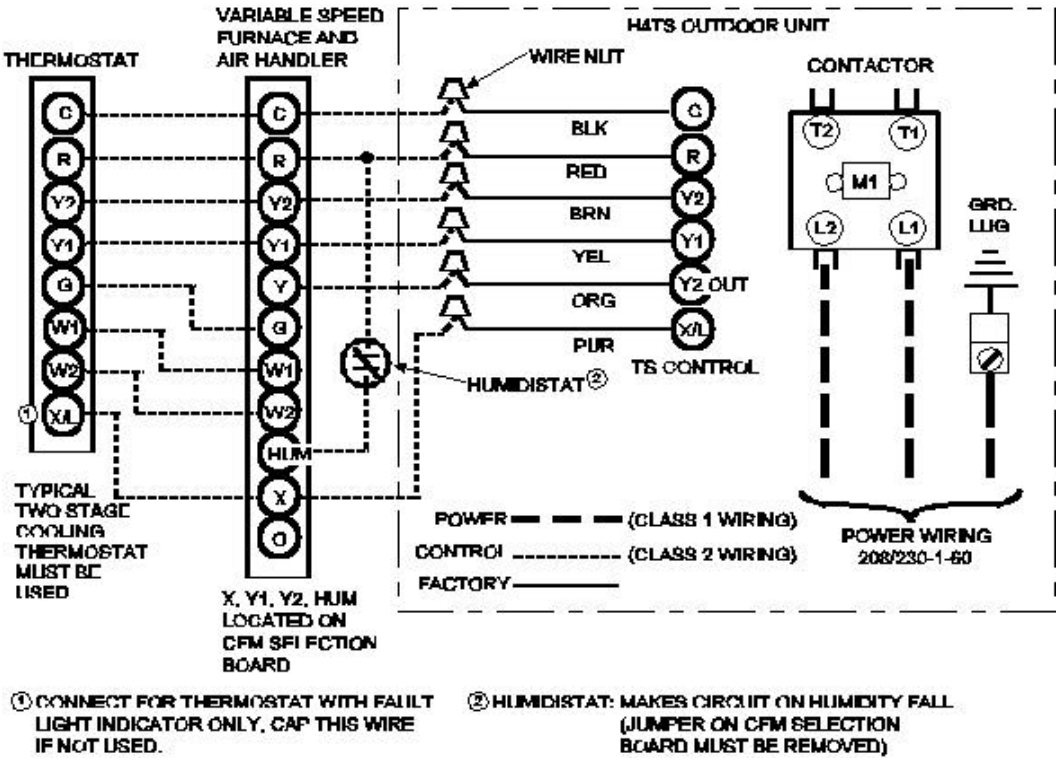

FIGURE 7 : TYPICAL FIELD WIRING: H*TS WITH P*DU, P*XU VARIABLE SPEED FUNACE AND H*TS WITH N*VS, F* FV VARIABLE SPEED AIR HANDLER

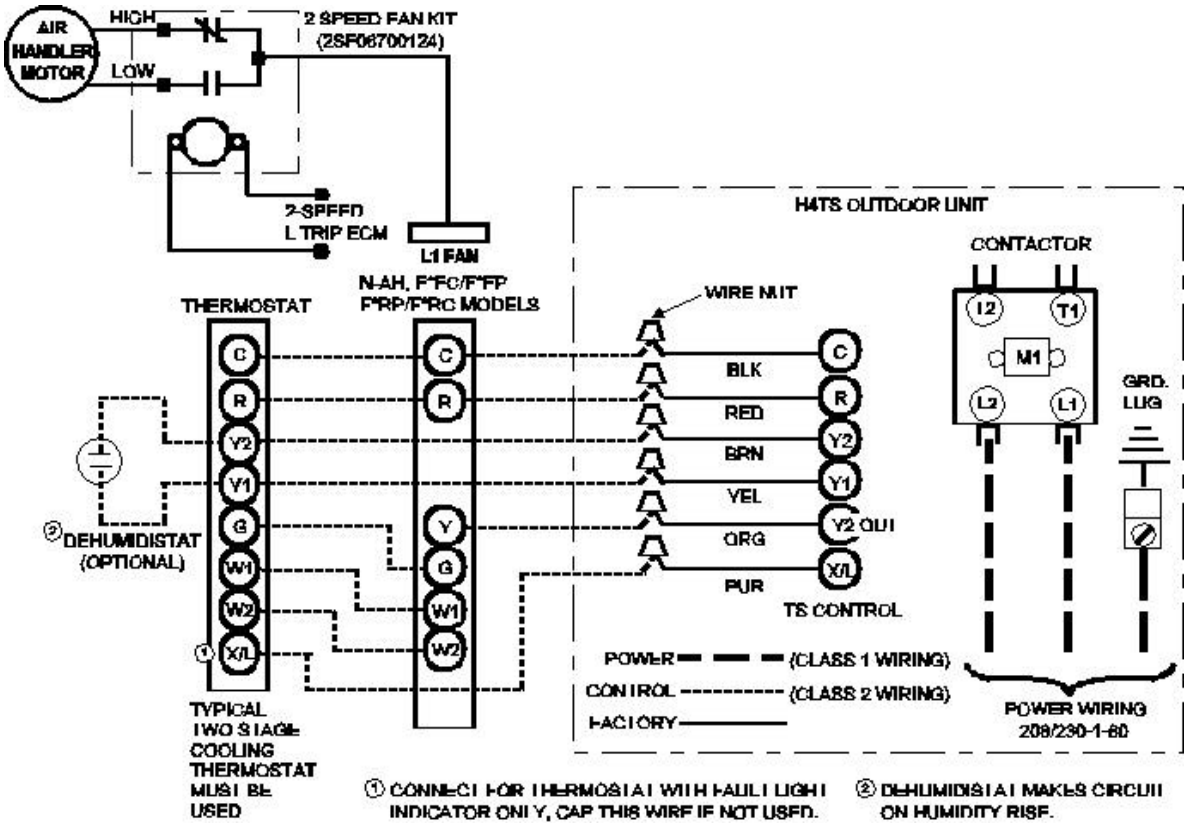

FIGURE 8 : FIELD WIRING: H*TS WITH N-AH, F*RP/F*FP, F*RC/F*FC MODELS AND 2-SPEED FAN KIT

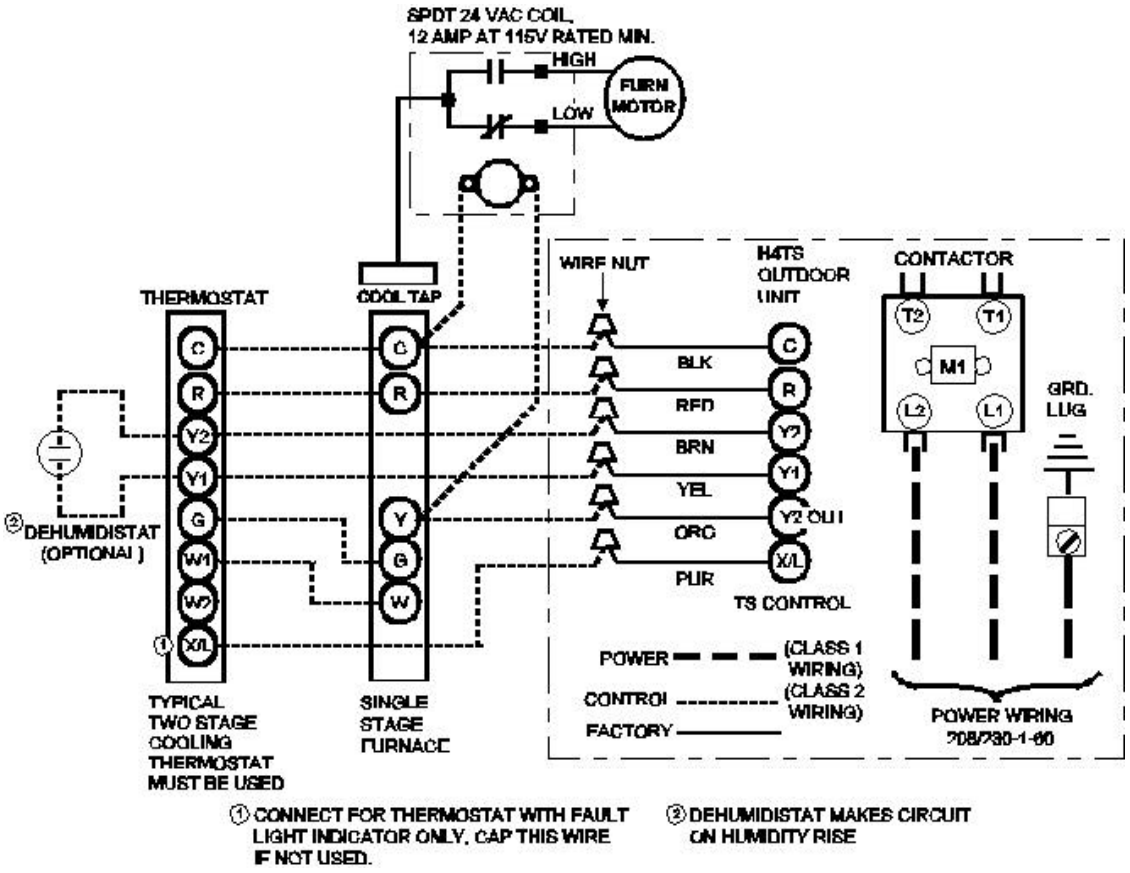

FIGURE 9: TYPICAL FIELD WIRING: H*TS WITH SINGLE STAGE FURNACE

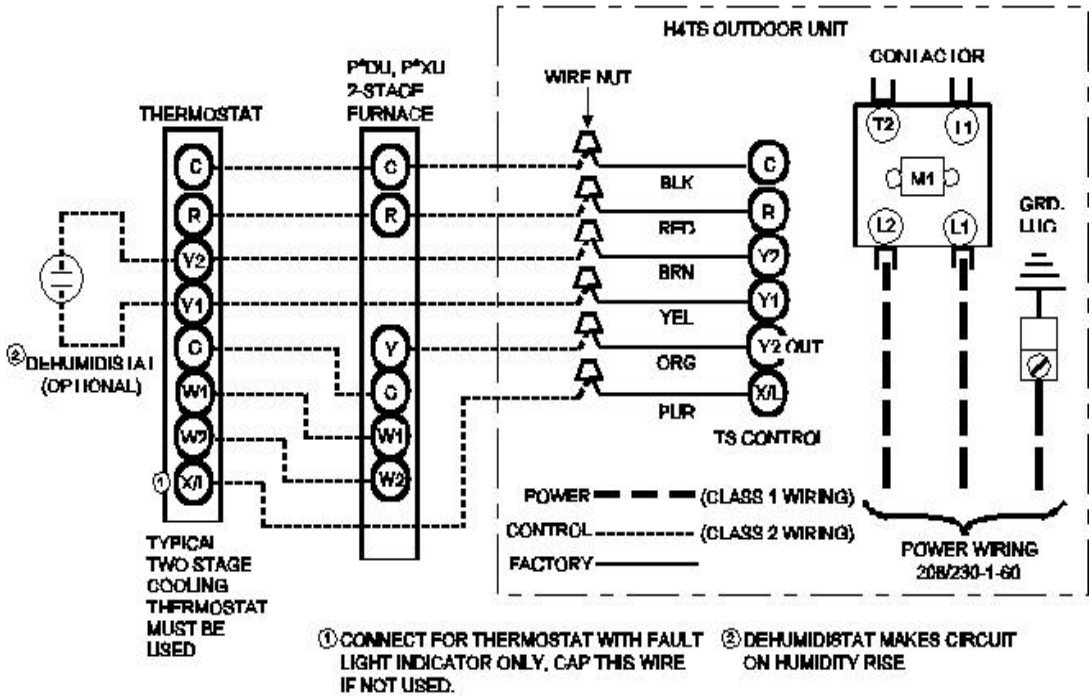

FIGURE 10: TYPICAL FIELD WIRING: H*TS WITH P*DU/P*DD/P*XU 2-STAGE FURNACE

Two Stage Furnaces - The ideal fan setting is to set the high speed (second stage) air flow at the fan motor high speed and the low speed (first stage) airflow at the fan low speed. If the low speed air flow is too high, unsatisfactory dehumidifaction may occur on first stage operation. To correct for unsatisfactory dehumidification, either add a dehumidistat per figure 10 or change the blower motor for better air flow performance.

SYSTEM START-UP

ENERGIZE CRANKCASE HEATER

This unit is equipped with a crankcase heater for the compressor.

A warning label with an adhesive back is supplied in the unit installation instruction packet. This label should be attached to the field supplied disconnect switch where it will be easily seen. See below.

IMPORTANT

An attempt to start the compressor without at least 8 hours of crankcase heat will damage the compressor.

In order to energize the crankcase heater:- Set indoor two stage cooling thermostat to "OFF" position.- Close the line power disconnect to the unit.

CHECKING SYSTEM CHARGE

The factory charge listed in the tabular data sheet and unit nameplate data is for the smallest matching indoor coil and 15 feet of line set. The tabular data sheet also lists the additional charge for other matching indoor coils and the additional charge for longer line sets.

⚠ WARNING

It is unlawful to knowingly vent, release or discharge refrigerant into the open air. It is necessary to recover the refrigerant during any repair or installation of the system.

⚠ CAUTION

Refrigerant charging should only be carried out by a qualified air conditioning contractor.

The H*TS condensing unit must only be used with the matching thermostatic expansion valve kit listed in the tabular data sheet. The best way to check the system charge is by checking the system subcooling during the second stage of operation.

SERVICING AND VERIFY:

For 2nd stage (2 cylinder) operation, the recommended subcooling for H*TS036 is 14°F and 20°F for all other models. For 1st stage (1 cylinder) operation, the recommended subcooling is 10F for all models.

1. Set the system running in the second stage (2 cylinder operation) by setting the thermostat at least 6°F below the room temperature. Short the “TEST” pin to bypass the 5 minute anti-short cycle timer if necessary.
2. Operate the system for a minimum of 15 to 20 minutes.
3. Refer to the tabular data sheet for the recommended airflow and verify this indoor air flow (it should be about 400 SCFM per ton)
4. Measure the liquid refrigerant pressure P and temperature T at the service valve.
5. Calculate the saturated liquid temperature ST from Table 1.
6. Subcooling temperature TC = Saturated Temperature ST - Liquid temp T

*Example: The pressure P and temperature T measured at the H*TS024 service port is 220 Psig and 95°F. From Table 1, page 12, the saturated temperature for 220 Psig is 108. The subcooling temperature TC = 108 - 95 = 13°F.*

The recommended subcooling level should be about 14+/-3°F for H*TS036 and 20+/-3°F for all other models. Add charge if the calculated subcooling temperature TC in step 6 is lower than the recommended level. Remove and recover the refrigerant if the subcooling TS are higher than the recommended level.

TABLE 1: R-22 SATURATION TEMPERATURE

ST[1]	90	91	92	93	94
P[2]	168	171	174	176	179
ST	95	96	97	98	99
P	182	185	187	190	193
ST	100	101	102	103	104
P	196	199	202	205	208
ST	105	106	107	108	109
P	211	214	217	220	223
ST	110	111	112	113	114
P	226	229	233	236	239
ST	115	116	117	118	119
P	243	246	250	253	256
ST	120	121	122	123	124
P	260	263	267	271	274
ST	125	126	127	128	129
P	278	282	285	289	293
ST	130	131	132	133	134
P	297	301	305	309	313

1. ST = Saturated Temperature
2. P = Pressure

RECORDING TOTAL SYSTEM CHARGE

The factory charge in the outdoor unit is listed on tabular data sheet and includes enough charge for the unit, matched evaporator and 15 feet of lines. Installations over 15 feet long and some indoor coil matches may require some additional charge.

The "TOTAL SYSTEM CHARGE" must be permanently stamped on the unit data plate.

Refer to the tabular data sheet and determine the system charges as follows:

1. Determine the condensing unit charge
2. Determine indoor coil adjustment charge
3. Calculate the additional charge for line lengths greater than 15 feet using refrigerant line adder (oz./ft.).
4. Total system charge = Item 1 + Item 2 + Item 3.
5. Permanently stamp the unit data plate with the total amount of refrigerant in the system.

SYSTEM FUNCTIONS

This premium Stealth™ condensing unit with a TS™ compressor is designed to provide maximum efficiency and comfort to the user. This unit has a control with many unique features that are described below.

First and Second Stage Compressor Modes

The TS™ compressor is a single two cylinder-reciprocating compressor. The first stage mode operates only one cylinder producing a part load capacity and high operating efficiencies. The system is sized so that over 80% of the cooling requirements are met by this mode. The operating time for first stage will be slightly longer than with a single speed compressor system. The high efficient operation offsets the longer run time for a total energy reduction. The second stage mode operates both cylinders for full capacity to meet peak cooling demands.

To operate one cylinder, the compressor motor runs in the reverse direction of the two cylinder (full capacity) mode. This is accomplished by reversing the motor run and start windings through the control circuitry.

All units come factory equipped with Hard Start components sized and optimized for one and two cylinder operation. Since all installations must be with a TXV valve and the switching time from first to second stage is 5 seconds, hard start components are mandatory. The Hard Start components are wired across the compressor run capacitor and not the compressor start windings.

Dehumidification

The product is designed to run longer on first stage than a regular single speed compressor system. This additional run time provides for better dehumidification and consistent room temperatures. However, there may be installation environments that the humidity levels are unacceptable. In this case the addition of a humidity control will resolve these issues.

A humidistat installed with a variable speed air handler or furnace reduces the airflow of the blower by 15% of the programmed speed during the dehumidification mode. This lower airflow reduces the evaporator temperature increasing the latent capacity. The humidistat for these variable speed systems opens the humidistat contacts on humidity rise. They are wired to the control system per figure 7.

A dehumidistat installed with a single speed or 2-speed air handler or furnace will force the system into second stage mode to increase the latent capacity. It is critical that the low speed blower operation is set as low to the recommended airflow to limit the number of time the unit will run second stage only for dehumidification purposes. The dehumidistats for these systems close the dehumidistat contacts on humidity rise. They are wired to the control system per figures 8 through 10.

COOLING OPERATION

The condensing unit requires a two stage cooling indoor room thermostat to operate correctly. The outdoor unit control has a fault signal output (X/L) that can light a fault light on a thermostat if that feature is available with the thermostat used.

With a call for first stage cooling (Y1), the outdoor fan and the first stage of the compressor are energized following the completion of a five-minute anti-short cycle timer. Simultaneously, the indoor blower is energized (see indoor blower operation section).

With a call for second stage cooling (Y2), while the unit is operating in the first stage mode, the contactor opens de-energizing the outdoor fan and the compressor. The control will switch the control circuit and five seconds later will energize the contactor starting the outdoor fan and the compres-

sor in the second stage mode. Additionally, the control outputs a 24v signal (at Y2 OUT) to control the indoor blower at the correct CFM.

If there is a call for second stage cooling (Y2) prior to the unit operating the first stage (i.e. if call occurs during the five minute anti-short cycle period), then the control will switch the control circuit and will energize the contactor starting the outdoor fan and the compressor in the second stage mode. Additionally, the control outputs a 24v signal (at Y2 OUT) to control the indoor blower at the correct CFM.

When the second stage of the room thermostat is satisfied only, the unit will continue to operate in the second stage mode.

When the first stage of the room thermostat is satisfied, the control will de-energize the contactor stopping the outdoor fan and the compressor.

If the room thermostat calls for second stage cooling (Y2) on two consecutive cooling cycles, the next call for cooling for either first (Y1) or second (Y2) stage will energize the unit in the second stage mode. The above mode will be reset to permit start up on first stage with only a Y1 call when the second stage operational cycle runs less than 15 minutes. This mode can also be reset when servicing the equipment by removing 24 V to the control.

NOTE: The control with not operate on Y2 without a Y1 signal.

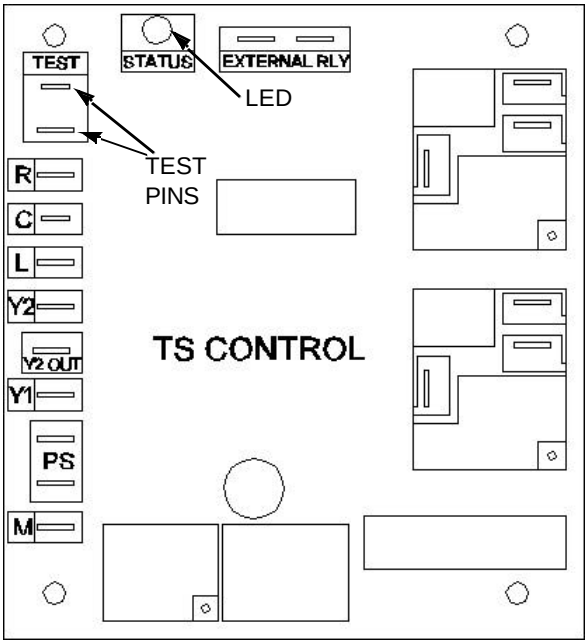

FIGURE 11 : COMFORT ENHANCER™ CONTROL BOARD

SYSTEM CONTROL BOARD FUNCTIONS

Refer to Figure 11 for view of Control Board.

Five Minute Anti-Short Cycle Timer

The control has a five minute time delay to prevent the system from short cycling after a thermostat off cycle or power interrupt. This five-minute delay is initiated following the completion of a first stage cooling call (Y1) or the 24v power up of the control. During this mode the control will not respond to any thermostat inputs and the LED will flash a code 1 at the control board.

For servicing or during installation of the condensing unit, the time delay may be by-passed by momentarily jumping the two test pins when there is a call for cooling (Y1 or Y2).

Pressure Switch Operation

The condensing unit is provided with high and low pressure switches installed and wired into the control to provide additional protection for the system if any abnormal operating conditions occur. The high pressure switch is threaded on a Schrader fitting located in the liquid line of the outdoor unit and a low pressure switch is brazed in the suction line of the outdoor unit. These two controls are wired in series to the unit control.

If the pressure switches detect a fault condition, they will open (high pressure opens with pressures greater than 400 psi and low pressure opens with pressures less than 25 psi) and the control will immediately shut down the unit. The control will go into a five-minute anti-short cycle mode inhibiting any thermostat inputs. Following the anti-short cycle mode, the control will permit the unit to start normally with the next call for cooling as long as the pressure switches have reset (high pressure resets at 300 ± 15 psi, low pressure resets at 65 ± 7 psi).

If the control detects a second pressure switch fault within one hour of compressor run time, the unit will again shut down and the unit control will lock out the unit until the fault condition is reset. During this period, a code "2" will be flashed at the control and provide a 24v signal on the X/L line to flash at the room thermostat.

Indoor Blower Operation

The indoor blower operation is controlled directly by the Y1 or G thermostat signal for the first stage of cooling and by Y2OUT from the control for the second stage of cooling. The reason the unit control controls the second stage blower is that the control will override the thermostat and continue second stage once the second stage of the thermostat is satisfied and there is still a first stage demand. Additionally, during the five second switching from first to second stage, the blower ramp up is delayed.

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TABLE 2 : FAULT CODES

LED @ control	Description	24V @ X/L line
HeartBeat	Normal Operation	None
1 Flash	Compressor waiting to complete Anti-short cycle period	None
2 Flash	Compressor lockout out on safety chain trip	Yes
On Steady	Control Failure	Yes
Off	No power or Control Failure	

HeartBeat – LED flash rate of 500 ms ON and 500 ms OFF
Flash/Error Code – LED flash rate of 350 ms ON and 350 ms OFF for the number of codes and with a pause of 1.5 seconds between flash codes.

Resetting Fault Conditions

The control locks out the unit and does not permit it to run when it detects certain fault conditions. Table 2 lists all the modes indicated by the control. Control code "1" is a temporary five-minute lock-out (see Anti-short cycle above). Control code "2" (pressure switch open) locks out the control and does not permit the unit to start until the fault condition is corrected. The fault code "2" can be reset by one of the following three methods.

1. Reset the 24v to the control (remove 24v and then reapply)

2. Jumper the test pins at the control board

3. If there is a call for Y1 or Y2 cooling, turn the thermostat to the off position then turn it to cool.

If methods 1 or 3 above are used, then the next call for cooling will allow the unit to start following a five-minute anti-short cycle period. If method 2 is used, then the unit will start immediately with the next call for cooling.

If the fault condition continues to exist prior to re-starting the unit, the control will lock out the unit again.

INSTRUCTING THE OWNER

Assist owner with processing warranty cards. Review Owners Guide and provide a copy for the owner guidance on proper operation and maintenance. Instruct the owner or the operator how to start, stop and adjust temperature setting.

When applicable, instruct the owner that the compressor is equipped with a crankcase heater to prevent the migration of refrigerant to the compressor during the “OFF” cycle. The heater is energized only when the unit is not running. If the main switch is disconnected for long periods of shut down, do not attempt to start the unit until 8 hours after the switch has been connected. This will allow sufficient time for all liquid refrigerant to be driven out of the compressor.

The installer should also instruct the owner on proper operation and maintenance of all other system components.

INDICATIONS OF PROPER OPERATION

Cooling operation is the same as any conventional air conditioning unit.

The following checks may be made to determine if the system is operating properly:

1. The outdoor fan should be running, with warm air being discharged from the top of the unit.
2. The indoor blower (furnace or air handler) will be operating, discharging cool air from the ducts.
3. The vapor line at the outdoor unit will feel cool to the touch.
4. The liquid line at the outdoor unit will feel warm to the touch.

If unit is not operating properly, check the following items before calling a serviceman:

1. Indoor section for dirty filter.
2. Outdoor section for leaf or debris blockage.

Eliminate problem, turn off the thermostat for 10 seconds and attempt start. Wait 5 minutes. If system does not start, call service technician.

MAINTENANCE

1. Dirt should not be allowed to accumulate on the outdoor coils or other parts in the air circuit. Clean as often as necessary to keep the unit clean. Use a brush, vacuum cleaner attachment, or other suitable means.
2. The outdoor fan motor is permanently lubricated and does not require periodic oiling.
3. If the coil needs to be cleaned, it should be washed with Calgon CalClean (mix one part CalClean to seven parts water). Allow solution to remain on coil for 30 minutes before rinsing with clean water. Solution should not be permitted to come in contact with painted surfaces.
4. Refer to the furnace or air handler instructions for filter and blower motor maintenance.
5. The evaporator coil drain pan should be inspected and cleaned regularly to prevent odors and assure proper drainage.

WHEN THE SYSTEM IS FUNCTIONING PROPERLY AND THE OWNER HAS BEEN FULLY INSTRUCTED, SECURE THE OWNER'S APPROVAL.

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